

Claims:

1. (Currently Amended) An extended rich mode tractive power-producing engine having an intake for hydrocarbon fuel and an exhaust, said extended rich mode engine configured to produce a substantially continuous optimized hydrogen rich engine exhaust comprising hydrogen and carbon monoxide having a combined concentration of hydrogen and carbon monoxide greater than 30% by volume;

an oxygen enrichment device having an oxygen stream effluent in fluid communication with said engine intake wherein said oxygen enrichment device is an oxygen separator, a pressure swing absorption oxygen separator, a SOFC oxygen separator, a ceramic membrane oxygen separator, or a combination thereof.

2. (Cancelled)

3. (Currently amended) An extended rich mode engine as in claim 1, wherein said engine is configured to produce a hydrogen rich engine exhaust having a combined concentration of hydrogen and carbon monoxide greater than ~~about~~ 50% by volume.

4-5. (Cancelled)

6. (Previously presented) An extended rich mode engine as in claim 1, wherein said hydrogen rich engine exhaust has a combined concentration of hydrogen and carbon monoxide greater than about 70%.

7. (Original) An extended rich mode engine as in claim 1, wherein said extended rich mode engine is an internal combustion engine.

8-9. (Cancelled)

10. (Original) An extended rich mode internal combustion engine as in claim 7, further comprising a rich homogenous charge compression ignition.

11. (Previously presented) An extended rich mode internal combustion engine as in claim 7, wherein said engine is configured with an oxygen enrichment device, a rich homogenous charge compression ignition, and an optional dilute cylinder system in part of said engine.

12. (Original) An extended rich mode internal combustion engine as in claim 7, comprising a spark ignition internal combustion engine.

13-14. (Cancelled)

15. (Original) An extended rich mode internal combustion engine as in claim 7, comprising a compression ignition internal combustion engine.

16-17. (Cancelled)

18. (Withdrawn) An extended rich mode engine as in claim 1, wherein said engine comprises a free piston gas generator.

19. (Withdrawn) An extended rich mode free piston gas generator as in claim 18, further comprising a rich homogenous charge compression ignition.

20-21. (Cancelled)

22. (Withdrawn) An extended rich mode engine as in claim 1, wherein said engine comprises an extremely rich inlet turbo-generator system.

23. (Withdrawn) An extremely rich inlet turbo-generator system as in claim 22, wherein said extremely rich inlet turbo-generator system is selected from the group consisting of a turbo-generator system having a two stage combustor and a turbo-generator system having a single stage combustor.

24-25. (Cancelled)